

## ORIGINAL ARTICLE

## MAJOR RISK FACTORS LEADING TO MATERNAL MORTALITY IN A TERTIARY CARE HOSPITAL

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**Background:** Maternal mortality is a major public health issue in developing countries due to its shocking magnitude and lower declining pattern. In developing countries where 99% of maternal death is occurring, little or no progress has been made. Objective of this study was to identify the underlying causes and factors associated with maternal mortality, and recommendations for quality improvement in maternal and obstetric care. **Methods:** It was a retrospective individual case review of maternal mortality audit. All cases of maternal death from January 2015 to December 2017 at Sheikh Khalifa Bin Zayed Al Nahyan/Combined Military Hospital Muzaffarabad were reviewed. **Results:** In the study period 31 maternal deaths were identified in 20,018 live births. Causes were classified as Direct (80.64%), Indirect (6.45%), and Unspecified (12.9%). Major underlying causes were eclampsia (9 cases, 29.03%), obstetric and non-obstetric sepsis (5 cases, 16.13%), antepartum haemorrhage (3 cases, 9.68%), postpartum haemorrhage (3 cases, 9.68%), hepatic encephalopathy (3 cases, 9.68%), and one case each of rupture uterus, abdominal pregnancy, cerebral haemorrhage, bronchial asthma. Four cases were unspecified. **Conclusion:** Some of the preventable, direct and indirect causes of maternal death have been identified. Recommendations of audit approach helped the hospital team to identify direct and indirect causes of maternal mortality and helped the management to take steps to reduce preventable factors for maternal death.

**Keywords:** Maternal mortality, under reporting, near miss, maternal morbidity

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## INTRODUCTION

According to World Health Organization (WHO) estimates, there were 287,000 maternal deaths in 2010 due to obstetric complications and Global Maternal Mortality Rate (MMR) declined down from 400/100,000 to 210/100,000 live birth now which shows 47% decline from 1990 statistics. In 2010, 85% of maternal deaths occurred in South Asia and Sub-Saharan Africa with one third of maternal deaths occurred in India and Nigeria. World's 40 countries that still have MMR above 300/100,000 all but four are in Sub-Saharan Africa and HIV accounted for 10% of maternal deaths. Some countries of the world still have MMR 300/100,000 that includes Afghanistan, Haiti, Timor and Laos. A girl in Chad has 1 in 15 chance of dying as a result of pregnancy or delivery while this chance is 1 in 30 in Afghanistan. In UK statistically significant fall in MMR to 11.39/100,000 has occurred, downward trend seen both in Whites and African.<sup>1</sup>

WHO defines maternal mortality rate as the number of maternal deaths per 100,000 women of reproductive age. Causes of maternal mortality are similar all over the world but the relative contribution of each cause varies from country to country. According to global estimates, the leading causes of direct deaths are haemorrhage, hypertensive disorders, and sepsis; all are treatable conditions. The number of direct deaths has changed little in last decade but the number of indirect deaths has increased steadily due to cancers, HIV,

cardiac and psychiatric illness.<sup>2</sup> In developing countries, underlying causes of maternal death includes illiteracy, lack of availability of primary health care facilities, inadequate transport facilities, lack of access to contraception, unsafe induced miscarriages, inadequate equipment in district hospitals and unskilled health professionals.<sup>3,4</sup>

The aim of Millennium Development Goal (MGD) 5 was a 75% reduction in the global maternal mortality rate from its 1990 level by the year 2015. WHO and World Bank supported toward this target but varied progress was made and was able to decline maternal mortality rate to 47% from 1990 level to 210/100,000 live births. Now the aim of MDG is to reduce maternal mortality rate to less than 70/100,000 live births by the year 2030. Maternal morbidities and mortalities have a great impact on social and psychological wellbeing of the whole family.<sup>5-10</sup>

Every effort should be made to reduce all preventable deaths. Maternal death audit is an effective measure that can help to reduce obstetric morbidity and mortality.<sup>11</sup> Audit is not for finding errors, negligence or misconduct but it helps to identify important risk factors, quality of care, direct and indirect causes and gives insight into challenges of real life medical practice and helps to indicate how deaths can be avoided. Different studies from Asian and Sub Saharan African countries have shown that audit has always helped in improving quality of care and proven role in reducing maternal morbidities and mortalities.<sup>12,13</sup>

Audit in health care system helps to identify the resources, availability of manpower, quality of care, sequence of events and factors associated with morbidity and mortality, direct and indirect causes of death. Through audit we can gather relevant information that can help us in planning different measures to reduce or avoid such events in future.<sup>14,15</sup> Nowadays audit has an important role in measures to reduce morbidity and mortality both in developed and developing countries. This is a way to plan effective measures, develop protocols and guidelines and monitoring of their implementation to prevent happening of such shocking events in future.<sup>16-18</sup> This study was conducted to highlight direct and indirect causes and associated inciting factors for maternal death.

## MATERIAL AND METHODS

Maternal death audit was done by review of individual cases—one of the methods of audit. Permission was obtained from Hospital Ethical Committee. Data were obtained from hospital records (case files, admission and delivery registers, and death certificates). All obstetric patients' records were thoroughly revisited and various parameters tabulated. Causes of maternal death (direct and/or indirect) were analysed. All 31 maternal deaths at Sheikh Khalifa Bin Zayed Al Nayhan/ Combined Military Hospital Muzaffarabad from January 2015 to December 2017 were reviewed. Data were collected and analysed using SPSS-17. Frequencies and percentages for different parameters were calculated.

## RESULTS

Yearly number of obstetric patients and their outcome is tabulated in Table-1. Among 21,811 obstetric patients, 20,018 cases had live birth and 31 mothers expired during the study period from Jan 2015 to Dec 2017.

**Table-1: Yearly and total number of obstetric patients during study period, and their outcome**

Year	Obstetric patients	Vaginal delivery	Caesarean section	Instrumental delivery	Expiry
2015	6,872	3,589	2,623	145	11
2016	7,252	3,671	2,920	139	11
2017	7,687	3,971	3,039	142	9
<b>Total</b>	<b>21,811</b>	<b>11,231</b>	<b>8,582</b>	<b>426</b>	<b>31</b>

The mean age of mothers who died was 28±5 years and 77.4% were in 20–35 years age group. Nearly 67.74% of mothers were Para 2 or more, while approximately 33% of mothers were primigravida or in their second pregnancy (Table-2).

Fifteen (48.38%) of mothers were delivered *per vaginam* while caesarean section was performed in 35.48% of mothers. Nearly 83.87% of maternal deaths occurred in postpartum period and 16.13% occurred in the antepartum state. Approximately 19.35% of mothers died within first few hours of admission (Table-3).

**Table-2: Demographic features of deceased patients**

Parameter	Patients	Percentage
<b>Age Group (Years)</b>		
<20	2	6.4
20–35	24	77.4
>35	5	16.1
<b>Parity</b>		
P <sub>0</sub>	4	13.5
P <sub>1</sub>	6	19.7
P <sub>2</sub>	8	25.8
P <sub>3</sub> and above	13	41

**Table-3: Audit parameters**

Parameter	Patients	Percentage
<b>Delivery status before death</b>		
<b>Delivered</b>	26	83.86
SVD	15	48.38
LSCS	11	35.48
<b>Undelivered</b>	5	16.12
<b>Time since admission (Hr)</b>		
2–6	6	19.35
7–24	11	35
25–48	10	30.65
>48	4	15
<b>Cause of Death</b>		
Eclampsia	9	29.03
Sepsis	5	16.12
APH	3	9.68
PPH	3	9.68
Hepatic encephalopathy	3	9.68
Rupture uterus	1	3.22
Abdominal pregnancy	1	3.22
Cerebral haemorrhage	1	3.22
Bronchial asthma	1	3.22
Unspecified	4	12.9

## DISCUSSION

Hypertensive disorders of pregnancy are the commonest cause of death in our study. These disorders are the common cause of death in developing countries, even in developed countries women still die from eclampsia. In 2006–8 confidential enquiry report in UK, 19 deaths were from preeclampsia and eclampsia, nine of which were due to intracranial haemorrhage. Worldwide, maternal mortality from hypertensive disorders, accounts for approximately 60,000 deaths per year. Because of adverse effects of hypertensive disorders, women require intensive surveillance during antenatal period for progression of disease and prompt intervention if complication arises.

The postpartum sepsis was the second commonest cause of mortality in this study. Sepsis is now a leading cause of death in developed world. In last triennial report of confidential enquiry into maternal death, demonstrates that puerperal sepsis is not a disease of past, but it is a leading cause of direct maternal death in recent era. Haemorrhage is still a leading cause of maternal death in both developed and developing countries. Incidence in developed world is approximately 5 percent while of massive haemorrhage is 6–7 percent. In this study we had nearly 10% of death due to postpartum haemorrhage.

This study divulged that maternal death can occur in any pregnancy, even common in young women, therefore significance of standard schedule of antenatal appointment, investigations and intervention offered by health professionals cannot be ignored. Pregnancy is a unique physiological condition with pre-existing medical issues, it is perhaps important to emphasise that all pregnant women would have received prenatal counselling and information from healthcare services regarding pre-existing medical condition and risk factors. This study also revealed that death were most common in postpartum period and within early hours after admission, it focus attention on early transfer to tertiary care setting from basic health units and proper training of midwives and healthcare professionals in emergency obstetrics.<sup>6,15,16</sup> Various studies have shown that delay in achieving appropriate treatment was cause of maternal deaths in most setting.<sup>19,20</sup>

Mortality from haemorrhage, sepsis, pre-eclampsia, eclampsia and its complications is common in both developing and developed countries, a study conducted in Sub Sahara Africa showed that major direct cause of deaths were haemorrhage (34%), sepsis (10%), hypertensive disorders and its complication (9%) and obstructed labour in (4%) of cases while in developed countries while hypertension and its complication were commonest cause of mortality and haemorrhage accounted for death in 13% cases.<sup>21,22</sup>

A study was conducted in Suriname to identify the causes of maternal mortality and sub-standard factors, identified that major underlying causes for death were sepsis both obstetric or non-obstetric (27%), haemorrhage (20%), hypertensive disorder and its complications (14%) of cases. Substandard care was present in (95%), it was related mainly with health care professionals such as delay in diagnosis or providing appropriate treatment.<sup>10</sup>

According to WHO systematic review on causes of maternal deaths globally, haemorrhage was the leading cause of death worldwide involving 27.1% of cases and more than two-third deaths were due to post-partum haemorrhage. The second common cause of maternal mortality was hypertension involving 14% of cases. Maternal mortality due to sepsis was noticed in 10.7% of cases, unsafe miscarriages involved in 7.9%. Embolism and other direct causes accounted for 12.8% and obstructed labour in 2.8% of worldwide mortalities. More than 70% of indirect deaths were due to pre-existing medical problems including HIV involved in 5.5% of deaths.

The causes of deaths vary globally; haemorrhage accounted for 36.9% of deaths in Northern Africa but hypertensive disorders were important cause in Latin American and Caribbean involving 22.1% of cases. All deaths related to sepsis

were in developing countries and greatest number (13.7%) was from South Asia. Indirect deaths were highest in South Asia followed by Sub Saharan Africa. In developed countries nearly one quarter of deaths occurred due to indirect causes.<sup>20</sup>

Clinical audits in health care system critically analyse the medical care, and include resources, procedures, investigations, diagnosis and treatment, referral and outcome including morbidity and mortality. Audits are done to improve the standard and quality through sequence of order of medical care (process, structure and outcome).<sup>17,18</sup> In obstetrical practice, audit of near miss help to identify the risk factors and developing local protocols and guidelines.

Maternal death can be prevented by identifying the women at risk and providing with appropriate care. Education of women is very important. As MMR begins to rise after the age of 35, multipara are recognized as high risk but age and parity goes together. Obese women, Body mass index 50 or above showed increase risk of severe morbidity including 5 fold increase risk of pre-eclampsia, multiple pregnancy and thromboembolism and is associated with double risk of maternal death.

Maternal mortality is considered as a marker of functional health services. Long term sustainable improvement in safe motherhood can be achieved by improving the function of health system through good quality comprehensive health care services. Trained health care professionals, necessary drugs and equipment, communication and strong referral system, early transfer to higher tertiary care centres through transport facilities and prompt identification, and treatment of complications can help to reduce maternal morbidity and decrease mortality.

## CONCLUSION

Although total number of maternal deaths has fallen to less than 300,000 per year worldwide, it still represents a preventable tragedy. Maternal death is still common in many parts of the world but has become rare in developed countries. Maternal death can be a shattering experience for everyone involved. Lesson for prevention are better learned by aggregating cases and undertaking surveillance through audit of near miss and mortality. Analysis of these allows a more representative picture to allow policy guidance. The most valuable lesson from audit of near miss is that even if the maternal mortality rate is very low, the risk of pregnancy has not gone away. So, the audit of morbidity and mortality are complementary and should be done routinely. The audits have helped to classify the causes of maternal deaths and identify factors surrounding them, and to make recommendation for change in professional care and behaviour in community.

## RECOMMENDATIONS

- Provide high quality information on the aim of antenatal care
- Provide advice and education on the abnormal sign and symptom of pregnancy
- Identify risk factors for development of complications
- Offer evidence based treatment options for medical conditions pre-existing or arise in pregnancy
- Multidisciplinary approach with early involvement of senior clinicians
- Early shift of critical patients to high dependency units
- Early transfusion and correction of coagulopathy
- Importance of early transfer to tertiary care centres
- Emphasis on thorough documentation of all the events in high risk cases
- Effective communication between health professionals, departments, patient and its family
- Emphasis on post natal and post operative follow up
- Regular simulation based training of all maternity staff
- Training of health care professionals on advance life support in obstetrics
- Adequate availability of staff, lifesaving drugs, equipment and resuscitation materials
- Policy for development of local protocols/guidelines
- Ensure implementation of guidelines and protocols

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**UN:** Data analysis and interpretation

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